



Review article

Physicians' attitudes and views regarding religious fasting during pregnancy and review of the literature

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ARTICLE INFO

Article history:

Received 8 August 2018

Received in revised form 6 December 2018

Accepted 7 December 2018

Keywords:

Fasting
Pregnancy
Ramadan
Yom Kippur
Religious fast
Complications

ABSTRACT

Many patients worldwide seek medical advice regarding safety of fasting during pregnancy. This issue lacks high quality evidence, which makes giving medical advice challenging. To aid decision making on this subject we performed an internet mediated survey to determine the expert opinion on this issue. The survey was answered by one hundred and eight obstetricians and gynecologists (OB/GYN). The questions were aimed at the content of the medical advice given to pregnant patients on Ramadan (for Muslim patients) and Yom Kippur (for Jewish patients) fasts. For both fasts, most physicians recommended against fasting on the second or third trimester, while fasting on the first trimester was controversial. Differences were found between medical advices provided by physicians according to their demographical characteristics. Regarding Ramadan fast, senior specialists were more lenient about fasting than younger specialists (62% and 35%, respectively, $p=0.01$). As to Yom Kippur fast, religious and traditional physicians were more likely to permit fasting compared to their secular colleagues (53% and 25%, respectively, $p=0.01$). Additionally, a comprehensive literature review was conducted revealing possible adverse maternal and fetal outcomes of fasting; however the risk for long term clinical complications is yet to be defined.

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Introduction

In the state of Israel there are two main sub-populations who wish to fast during pregnancy for religious reasons; Muslim women during the month of Ramadan and Jewish women on the day of Yom Kippur. The fasts differ in a number of characteristics; The Ramadan fast days last from sunrise to sunset, while the duration of the fast (between 12–16 h) and the season when it occurs, varies according to the Muslim calendar. These fast days are observed for an entire month. On the other hand, the Yom

Kippur fast lasts from sunset until the emergence of stars on the next day (25 h), and it always takes place in September or October. In terms of Muslim law, pregnant women are allowed to postpone Ramadan fasting, but despite the permission many are interested in fasting [1]. In Jewish law, there are different approaches regarding the obligation of pregnant woman to complete the fast, and the medical opinion is a significant factor when approaching this question. For these reasons, OB/GYNs worldwide are frequently asked by Muslim and Jewish patients regarding the safety of fasting during pregnancy, although there is no consensus on the subject. The aim of this article was to outline the experts' opinion regarding fasting for religious reasons during pregnancy; both by a physicians' survey and by a comprehensive review of the literature.

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Materials and methods

Between March and June 2017, an internet mediated survey of OB/GYN physicians was conducted, including one hundred and eight physicians across Israel. The questionnaire included questions regarding their medical recommendations for pregnant women who desire to fast on the month of Ramadan or on Yom Kippur. In addition, the participants were asked to reveal the factors which influenced their medical advice. Attitudes were compared according to OB/GYNs' demographic characteristics (gender, age, employment location, religion and religious identity) and professional parameters.

The data was collected and processed using the SPSS version 18.0 (IBM, Armonk, NY, USA) software. Categorical variables were presented as a percentage of values which were not missing. Correlation between variables was examined by chi square, and the results were interpreted as statistically significant when $p < 0.05$.

We performed a computerized search using MEDLINE, Cochrane Database of Systematic Reviews and Google scholar. A combination of keywords related to "fasting", "Ramadan", "Yom Kippur" and/or "pregnancy" was used. To locate additional publications, we reviewed bibliographies of identified studies and review articles. The language was restricted to English or Hebrew.

Results

One hundred and eight physicians across Israel answered the survey; their demographic and professional characters are displayed on Table 1.

Regarding the first trimester of pregnancy, 47% of physicians recommended that fasting is inadvisable during the month of Ramadan, and 43% replied that fasting is inadvisable on the day of Yom Kippur. However, fasting during the second or third trimester was inadvisable by 65% and 60% of physicians on Ramadan and on Yom Kippur, respectively (Table 2). A similar pattern was observed when the sample was limited to certified specialists only. The difference between different periods of pregnancy, that was observed both for Ramadan and for Yom Kippur fasts, was only in one direction; All physicians who gave diverse advice between the two periods within pregnancy, believed that fasting during the first trimester is permissible but not recommended in advanced pregnancy. On the other hand, for varied medical advice between Yom Kippur and Ramadan fasts, no trend was identified.

A comparison between Jewish and Muslims physicians was not possible due to the small number of Muslims who participated in the survey ($N = 5$). However, other demographical characteristics were found to be correlated with the medical advice. On Ramadan – senior specialists were more lenient about fasting during the first trimester than younger specialists (62% and 35% respectively,

$p = 0.01$). A similar trend was observed regarding the second and third trimesters of pregnancy, although statistical significance was borderline (43% of senior specialists, 23% of younger specialists, $p = 0.053$). Regarding other parameters such as religious identity and gender, no statistically significant correlation was observed. On Yom Kippur - religious identity was correlated with the medical advice regarding advanced pregnancy. Jewish physicians who defined themselves as religious or traditional were more lenient about fasting than their secular Jewish colleagues (53% and 25%, respectively, $p = 0.01$).

Different supporting factors were chosen by the physicians for the medical advice provided, which are outlined in Table 3. Overall only 41% of responders chose professional literature as a source of information, although there was no consensus regarding its quality. Most physicians chose personal professional experience and biological reasoning as sources of knowledge. Among physicians who were lenient toward fasting, understanding the patient's religious needs was significant, compared to the physicians who recommended against fasting and were concerned about the duty of care.

Comment

The findings of our survey, which to the best of our knowledge was the first to be conducted on this topic, indicate that there is a great variation between OB/GYNs regarding safety of fasting during pregnancy. Most physicians share the opinion that it is inadvisable to fast in the second and third trimesters of pregnancy, although regarding the first trimester opinions are divided. The lack of trend when comparing Ramadan to Yom Kippur can be explained by their different nature. The difference between early and advanced pregnancy may be related to the presence of medical literature that is more available regarding complications of fasting during advanced pregnancy. Less than half of the physicians chose professional literature as an influential factor in the process of providing the medical advice, although the literature was chosen to support opposing views (Table 3). This result reflects the controversy arising from the professional literature which will be reviewed below.

The impact of fasting on the metabolic system was demonstrated in some studies. One study compared women who were scheduled for termination of pregnancy to a control group of non-pregnant women. After 12 and 20 h of drinking solely water there were lower blood glucose and insulin levels among pregnant women compared to non-pregnant women, a phenomenon that continued 12 h after the resumption of eating. Moreover, prolonged fasting duration was associated with a decrease in amniotic glucose levels [2]. According to another study, fasting for 12–18 h during the third trimester caused pregnant women a decrease in glucose and insulin levels in the blood, and increased levels of alanine, free fatty acids and β -hydroxybutyrate. This phenomenon was not observed in non-pregnant women, and was named "accelerated starvation [3]." The metabolic effect was even more pronounced in women with twin pregnancies, who had higher β -hydroxybutyrate levels than women with single pregnancies after night fasting [4].

The effect of fasting on labor and delivery was studied separately for term and preterm pregnancies. In a study published in 1982, Cohen found an increase in the average number of deliveries on Yom Kippur, rather than a decrease which is common on other holydays [5]. In 1983, Kaplan et al. demonstrated that on Yom Kippur the number of deliveries was not different from the average, but the next day it doubled. The increase included only spontaneous term deliveries. This study coined the term "Yom Kippur effect" [6]. Wisner et al. found that the number of daily deliveries increased on Yom Kippur and the next day compared

Table 1
Demographic and professional characteristics of survey responders.

Parameter	N (%)
Total	108 (100%)
Gender	
Male	59 (55%)
Female	49 (45%)
Religion	
Jewish	99 (92%)
Muslim	5 (5%)
Christian	3 (3%)
Religious identity	
Secular	68 (64%)
Religious	29 (27%)
Traditional	10 (9%)
Professional certification	
OB/GYN Resident	12 (11%)
Certified specialist (≤ 10 years)	37 (35%)
Certified specialist (> 10 years)	54 (51%)
Non specialist OB/GYN	3 (3%)

Table 2

Medical Advice for Pregnant patients who wish to fast for religious reasons.

	Ramadan		Yom Kippur	
	1 st Trimester	2 nd & 3 rd Trimester	1 st Trimester	2 nd & 3 rd Trimester
N	107	104	106	106
Medically feasible	55 (51%)	31 (30%)	56 (53%)	35 (33%)
Medically non-recommended	50 (47%)	68 (65%)	46 (43%)	64 (60%)
Dependent on clinical features ^a	–	4 (4%)	2 (2%)	6 (6%)
I don't know	2 (2%)	1 (1%)	2 (2%)	1 (1%)

^a Added manually, including risk of preterm delivery, obstetric history, and season during the year on Ramadan.**Table 3**

Factors influencing medical advice regarding fasting during the second and third trimester of pregnancy.

Factors	All participants in survey	Medically feasible (both fasts)	Medically non-recommended (both fasts)	Feasible on Yom Kippur and non-recommended on Ramadan	Feasible on Ramadan and non-recommended on Yom Kippur
N	108	19	52	14	11
Personal professional experience	67 (62%)	15 (79%)	31 (60%)	8 (57%)	7 (64%)
Biologic reasoning	62 (57%)	11 (58%)	35 (67%)	8 (57%)	5 (45%)
Medical literature (Total)	44 (41%)	8 (42%)	18 (35%)	7 (50%)	5 (45%)
Good quality	12 (11%)	5 (26%)	4 (8%)	1 (7%)	–
Medium quality	17 (16%)	2 (11%)	6 (12%)	4 (29%)	3 (27%)
Poor quality	15 (14%)	1 (5%)	8 (15%)	2 (14%)	2 (18%)
Understanding of the patients religious needs	37 (34%)	12 (63%)	8 (15%)	9 (64%)	4 (36%)
Duty of care	37 (34%)	–	28 (54%)	4 (29%)	1 (9%)
Colleagues experience	13 (12%)	3 (16%)	6 (12%)	3 (21%)	–
Fear of legislation	1 (1%)	–	1 (2%)	–	–
Unpublished study ^a	1 (1%)	1 (5%)	–	–	–
Jewish law literature ^a	1 (1%)	–	–	1 (7%)	–

^a Added manually.

with the week before the holiday, for Jewish women only. No similar effect was observed a week later on a different Jewish holiday [7]. Lurie et al. found a significant increase in birth rates during the day after Yom Kippur. On a different Jewish religious fasting day (Tisha'a Be'Av) a decrease in birth rate was noted. The authors' conclusion was that there is no correlation between a 25-hour fast and delivery. Since the study population included a heterogenous group of patients, who either fasted during both days, on one of them or did not fast at all, it is difficult to draw conclusions from this study, except for the fact that the "Yom Kippur effect" was strengthened [8].

The Yom Kippur effect can be explained by the physiological response to dehydration. Avoidance of drinking during fast days causes dehydration as demonstrated by decreased urine output and increased osmolality during Ramadan fast days [1]. Arginine vasopressin (AVP) secretion in response to dehydration during labor can activate specific receptors as well as oxytocin receptors on the myometrium. Once the labor process has begun, myometrium cells are more sensitive to AVP than to oxytocin [9]. Hence, it is possible that dehydration precipitates labor in term pregnancies by a few hours to days in this manner. Several complications may be caused by labor induction in this setting, including uterine perfusion compromise, hyperstimulation and fetal heart rate decelerations similar to oxytocin labor induction, or remarkable ketone production. Since labor requires high energy consumption, metabolic deficit can cause lipolysis, keto bodies and even ketoacidosis. Maharaj [10] reported that avoidance of drinking or eating during labor is associated with need for augmentation of labor, forceps delivery and increased blood loss during delivery [10]. Although the Cochrane review on fasting for medical reasons during labor is inconclusive [11], it is possible that fasting adjacent to labor may increase the risk of maternal or fetal complications.

The effect of fasting on timing of delivery is also concerning in the context of preterm delivery (PTD), since the same mechanisms of initiation of labor may be present. Data regarding this effect is controversial. Animal studies have shown that avoidance of eating causes an increase in levels of prostaglandins and may result in premature contractions or even labor [12]. A possible explanation is that hypoglycemia causes the transport of free fatty acids, including arachnoid acid, causing production of prostaglandins and activation of premature contractions [12]. Another mechanism, which was suggested by Herrmann et al. [13], involves corticotropin-releasing hormone (CRH). Fasting causes the production of CRH mRNA in several regions of the brain in rats, and women who had preterm deliveries were found to have higher CRH levels in their blood. In addition, a correlation was demonstrated between fasting for more than 13 h and the risk of PTD. The authors suggest that a fasting state may cause stress, secretion of cortisol from the adrenal glands, and in response increased secretion of CRH from the placenta to maternal blood. CRH was found to increase the release of prostaglandins in vitro, and to increase the myometrial response to them [13].

Clinical studies in humans have not yielded conclusive results. A non-randomized prospective study that examined the effect of the Ramadan fast on PTD rates, found that the rate of PTD before 37 weeks of gestation was the same (10.4%) for both fasting and non-fasting patients. However, preterm deliveries before 32 weeks of gestation were 3-fold higher in the fasting group compared to the control group (1.5% and 0.5%, respectively, $p=0.623$). The authors concluded that fasting does not significantly increase the risk of premature delivery. However, since the power calculation in the study was aimed at the risk of PTD before 37 weeks of gestation, error type B is a possibility [14]. A large retrospective study comparing Jewish and Muslim patients, assuming that most Jewish women fast on Yom Kippur, found that Jewish ethnicity was

an independent risk factor for premature delivery on Yom Kippur. This correlation was not demonstrated on a different date a week earlier [15]. The findings of this study should be regarded with caution since fasting was assumed by ethnicity, and not by direct questioning. Many Jewish women do not fast on Yom Kippur, and moreover, during the years of the study (1988–2011) there were certain years when Yom Kippur and the month of Ramadan overlapped, therefore assuming Muslim patients did not fast was not accurate. Since both studies present methodological limitations, it is difficult to draw conclusions from the present data.

A 24-hour fast is associated with an increase in blood viscosity [16], which may expose pregnant patients to a higher risk of thromboembolic events. Fasting during the first trimester may be associated with low birth weight [17]. Additionally, several studies demonstrated concerning effects of fasting on fetal sonographic indices; such as lower Amniotic Fluid Index [18], fewer breathing movements [19], and increased uterine artery Pulsatility Index (PI) and Systolic/Diastolic ratio on Doppler [20]. In contrast, other studies reported that fasting was not found to affect fetal heart tracing, biophysical profile, PI of the umbilical or Middle Cerebral Arteries, gestational age, mode of delivery and neonatal outcomes [21,22]. Since fasting during pregnancy causes increased ketosis as described above, detrimental effects during the organogenesis period are a possibility. This hypothesis is supported by a study carried out on mice that were fed a ketogenic diet in early pregnancy [23]. Maternal and fetal hypoglycemia may affect the absorption of amino acids by the fetal brain [2], though long term neurologic complications were not proven [24]. No articles discussing the effect of fasting on pregnancy loss rate were found in our search.

The strength of our study is in its novelty, to the best of our knowledge this is the first study to obtain experts opinion on religious fasting during pregnancy. The number of physicians who answered the survey was large enough to draw conclusions regarding the common opinion within the medical community in our country. This information, together with the literature review, will allow physicians to answer this question in a more knowledgeable matter. The results of our study are limited by the fact that only few Muslim physicians chose to answer the survey, although the survey was widely distributed. Therefore we were not able to evaluate whether the religion of the physician has an influence on the medical advice. Another limitation is the fact that this study is not experimental, and is based on the physician's professional opinion. Since it is difficult to design a randomized prospective study in the setting of fasting during pregnancy, we believe that the expert's opinion and the literature review provided in this article will be a helpful substitute. Further information and research are warranted, including other influences on the reproductive system. For example, concerns regarding fasting effects on gonadotropins secretion [25] raise the question whether fasting during fertility treatments should be avoided as well.

In conclusion, in our era the medical community as well as society expects medical recommendations to be "evidence-based". Providing knowledgeable answers to questions regarding safety of fasting during pregnancy within this standard is confusing. Although several mechanisms for maternal and fetal adverse effects were demonstrated, such as increased ketosis or increased placental CRH secretion, their effect on the clinical outcome such as pregnancy loss or PTD rate have not yet been proven. The results of our survey reflect the same ambiguity within OB/GYNs in Israel. Most physicians suppose that fasting is not medically recommended for advanced pregnant patients. Half of them think the same for the first trimester of pregnancy. The fact that more OB/GYNs oppose fasting in advanced pregnancy than in the first trimester suggests the possibility that the evidence for adverse effects such as preterm labor is more compelling than the evidence

for possible adverse effects of fasting during the first trimester. Non-medical influencing factors on the medical recommendation is concerning and should be noted. Since a prospective randomized trial on this subject is not likely to be performed for ethical and practical reasons, it is reasonable to alert the patient regarding possible adverse effects of fasting during pregnancy. We believe that it is not recommended to restrain from both eating and drinking during all trimesters of pregnancy, or near term. For patients with a low risk pregnancy we advise drinking calorie containing beverages throughout the day, in order to maintain partial fasting. For patients with a high risk pregnancy recommendations should be considered individually.

Author contributions

C. Adler-Lazarovits – has substantially contributed to the conception and design of the work, the acquisition, analysis and interpretation of data AND has drafted and revised the manuscript AND approves the final version AND agrees to be accountable for all aspects of the work.

A.Y. Weintraub – has substantially contributed to the conception and design of the work and interpretation of data AND has helped with drafting and critically revising the manuscript for important intellectual content AND approves the final version AND agrees to be accountable for all aspects of the work.

Conflicts of interest

We declare no conflict of interest regarding the content of this paper.

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